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CARNAUBA WAX: BRAZIL'S MONOPOLY PRODUCT

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Quiz programs on the radio have done much to get people acquainted with strange and wonderful places and to refresh their memories with the major products coming from distant lands. If asked from what country the largest supply of coffee comes, almost anyone would immediately reply, "Brazil." If, however, you should ask these same individuals to name the country suggested by the production of carnauba wax, the probability is that most of them would be baffled. The reason for this is not perfectly clear. It is true that coffee is the most important export of Brazil but carnauba wax is among the first four products exported to the United States from our South American neighbor.[1] While approximately two-thirds of the world's supply of coffee comes from Brazil, the entire commercial output of carnauba wax comes from that country. Geography textbooks are very brief in their treatment of this product when it is mentioned at all. Chemists, on the other hand, have studied this wax in considerable detail but of course their interests have been focused on the determination of its composition and on finding new methods of preparing it for industrial purposes.

Why have geographers tended to shun this important commodity from Brazil? Two answers to the above question may be these: (1) relatively few travelers from the United States visit the area of production and (2) carnauba wax does not enter the retail market under that name. This latter condition is not true in the case of coffee.

[1] In 1940 carnauba wax was second in value among the products exported to the United States from Brazil.

USES OF CARNAUBA WAX

In what form then does carnauba wax find its way to the market? To name all of the products which are made from it would result in a long and monotonous list. However, every time we wax our floors or furniture, polish our automobile, or shine our shoes we are using carnauba wax. Transcribed radio programs are made possible by this wax, for it is used as a compound in the production of phonograph and dictaphone records. The artificial fruits, vegetables, and meat so frequently used in window displays and particularly in refrigerator sales rooms contain from five to ten per cent carnauba wax. It is also used extensively as a luster producing filler in the textile industry. Manufacturers of photographic films, carbon paper, soap, salves, and unguents likewise use considerable quantities of this product. Probably the earliest use to which the wax was put was the making of candles and it is still extensively used for this purpose. The fact that the wax does not easily melt makes candles containing some of it burn more slowly and with a much more steady light. Carnauba wax even enters into the defense program for it is used in the manufacture of picric acid which, in turn, is used in the manufacture of explosives. The above examples suffice to show the diversity of uses to which this commodity is put.

ENVIRONMENT OF THE CARNAUBA PALM

Altho the carnauba palm, the plant from which the wax is obtained, has been planted in many parts of the world, only in the drought region of northeastern Brazil has it produced extractable quantities of wax. Approximately fifty per cent of the producing palms are found in the two states of Ceara and Piauhy while the other half are widely scattered thru the seven adjoining states of the northeastern region (Fig. 1). In this region the uplands have been dissected by broad, shallow valleys in which continuously flowing streams are rarely found. Instead, most rivers consist of a series of elongated pools during the rainy season and completely dry mule tracks during the rest of the year. Under normal conditions about ninety per cent of the rain falls between December and April or early May. The rain falls as gentle showers during the early part of the wet season but later, heavy downpours lasting fifteen to forty-five minutes are the rule. "Frequently the whole

rainfall of a month is concentrated in three to five showers not more than a day apart.''[2]

Since the ground on which the rain falls is usually quite warm and has but a slight vegetation cover, evaporation is very rapid. The water which sinks into the dust soon becomes impregnated with saline materials and is of relatively small value for crop production. While the total amount of precipitation varies from ten

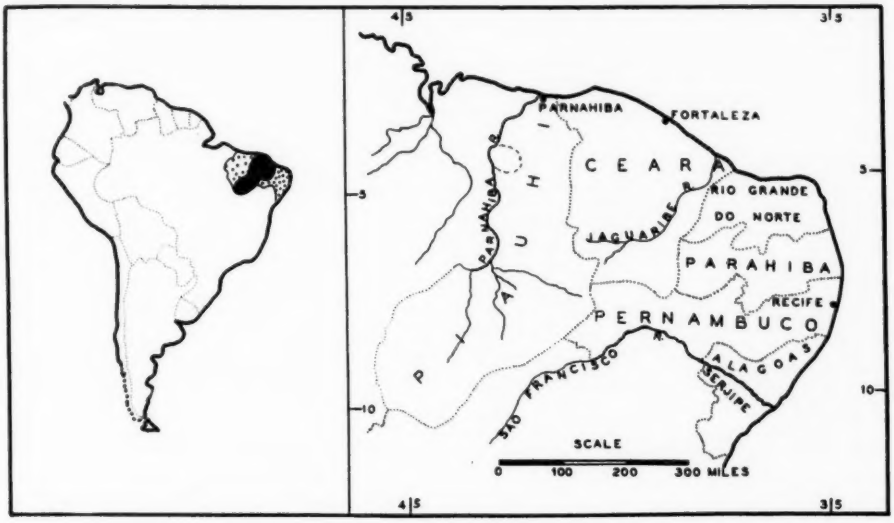

Fig. 1. The shaded area on the map of South America is the wax producing region. On the right side is a detailed map of this area. The Campo Maior area is enclosed by broken lines.

to fifty inches per year in various parts of the region, it is neither effective nor dependable. Droughts are frequent and in the state of Ceara the rainfall is especially variable. Kendrew points out that the annual rainfall has varied in the last sixty-six years from ninety-six per cent above to sixty-six per cent below the average. Floods and droughts are two characteristics of this part of Brazil which greatly handicap the development of a permanent agriculture. As a result, a relatively large part of the population is migratory.

During the wet season the carnauba palm absorbs a great quantity of water which is required to carry on its life functions. In

[2] Freise, Friedrich W. The Drought Region of Northeastern Brazil, *Geographical Review*, Volume 28, Pp. 363-378 (368).

order to protect it from excessive evaporation during the dry season, nature has provided a protective covering of wax. The more prolonged the dry season, the heavier the coating of wax. Collectors have observed that during dry years the yield is often twenty-five per cent above the average. Nature in this way partially compensates for the loss of other crops by increasing the

Fig. 2. The wax is harvested by squatters whose homes are shown above. Notice that carnauba palms are the only trees visible. The low wall on the right surrounds a drying field. Courtesy S. C. Johnson and Son, Inc.

yield of wax. Thus without a well-defined dry period the carnauba palm would be worthless as a producer of wax.

The most favorable habitat for this palm is in the broad, dry valleys or along river banks. It avoids the highlands and is seldom found even on the undulations of hilly country. It is not surprising, therefore, that the largest centers of production are along the Jaguaribe River in Ceara and in the Campo Maior district of Piauhy. Carnauba palms are usually found in pure stands, a characteristic not common among tropical plants. Growth is quite slow,

frequently attaining a height of only five feet after twenty years. A mature palm will reach a height of about forty feet.

HARVEST OF WAX

As soon as the main trunk of the palm has appeared it is safe to cut the leaves and collect the wax. It usually requires from seven to ten years for the main trunk to appear. Altho the trees grow wild they are on large tracts of land owned by the wealthier class who generally live in the cities. These land owners seldom, if ever, collect the wax themselves. The most common method is to rent the palm groves to the semi-nomadic herders who follow their cattle from water hole to water hole and during the harvest season squat on the property of the settled farmers (Fig. 2). The prospective renter estimates the amount of wax that may be obtained from any one grove and offers a cash rental for the privilege of collecting the wax. The renter, therefore, gets all of the available wax with little

FIG. 3. Cutting leaves from the palm. The older leaves assume a drooping position. Courtesy S. C. Johnson and Son, Inc.

thought as to the quality of it or the good of the tree. The owner usually buys the wax from the renter since he frequently is a trader in the city. Some of these herders do not have the money to pay cash rent and therefore must be satisfied to be hired to collect and prepare the wax for market. A third method of getting the wax harvested by these semi-nomadic squatters is by the share-cropping system.

Normally the dry season begins in July and continues until January or February. Within a month after the beginning of the dry season the leaves have exuded a considerable quantity of wax and harvest is started. The harvesting of the wax is quite simple. Workers are equipped with a hatchet-like knife attached to a long pole with which they cut the desired number of leaves from the trees (Fig. 3). If the maximum yield is to be obtained over a period of years, not more than twenty leaves should be cut from any tree in a given year. Three cuttings are usually made each year, ten leaves being taken from each tree the first time and five each the last two times. Ten or twelve weeks elapse between cuttings. During years when the dry season is especially prolonged, as many as five cuttings are made, but this greatly weakens the tree and leads to its early death.

The selection of the leaves to be cut is important, for upon that depends both the amount and the quality of the wax that will be obtained. As the young leaves begin to open they point upward but as the blades open and expand, their weight tends to pull the leaves outward and down so that eventually they are in a drooping position. Experience has taught the harvesters that a leaf has the maximum wax when it has reached a position described by the natives as "six o'clock," that is a horizontal position which points to the rising or setting of the sun.[3] After the leaves have been cut from the tree the long stems are removed, since they contain a negligible quantity of wax. The blades of the leaves are carefully stacked into two large baskets made of palm fiber and securely fastened to the side of a donkey. By this means they are transported to the drying fields (Fig. 4). Altho one or two large companies transport the leaves in motor trucks, the donkey continues to be almost the sole means of conveyance.

After the cut leaves have been exposed to the tropical sun for

[3] Walmsley, Jr., W. N. The Carnauba Palm and Its Wax, *Bulletin of the Pan American Union*, Vol. 73, P. 38.

three or four days they are thoroly dried. This process causes the leaves to wilt and shrink. Since the wax does not shrink with the leaf it becomes loose and is easily removed. In fact it often becomes too easily removed and a considerable quantity is lost by being

Fig. 4. A small donkey transports the fresh cut leaves to the drying fields. Only the blade of the leaf is taken. The stem is removed and thrown on the discard pile at the right. Courtesy S. C. Johnson and Son, Inc.

blown away. To reduce this to a minimum, low walls are built around the drying fields and these serve as wind breaks. The two greatest hazards at this stage of the harvest are (1) strong winds and (2) an unexpected shower. The producers in Piauhy are in

much greater danger of loss of their harvest by an unexpected rain than in the state of Ceara.

The Preparation of the Wax

From the drying fields the leaves are taken to the threshing shed, a room which is almost completely sealed. There is only one opening about six inches square which is supposed to admit all the light and air that is needed for the operations. While there are variations in the method of preparation, they all follow the same general plan. Within the threshing room three men, stripped to the waist, perform the most violent activity associated with the production of the wax. First the leaves are drawn over a block in which six or eight sharp knives have been set, points up. This cuts the leaves into shreds and releases wax that is found in otherwise inaccessible parts of the leaf. The split leaves are handed to the second worker who tears them apart and then passes them to the last member of the trio. The shredded leaves are then violently beaten over a saw-horse or similar object until all vestige of wax has been removed. The spent leaves are thrown thru the ventilation hole and are used in the manufacture of hats, baskets, hammocks, blankets, and similar objects. Between three thousand and four thousand leaves can be handled daily in the threshing room by a crew of three. Night is the preferred time for threshing because (1) it is cooler for the workers and (2) the cool night air is also more moist and the wax dust does not blow away so badly. This dust is carefully gathered into baskets or tin pails and sent to the melting room where the final step in its preparation takes place before it is shipped.

The quality of the wax depends upon two factors, (1) the age of the leaves and (2) the method employed in the melting process. If very young leaves are used the quality is the highest but the yield is low and continuous cutting of these very young leaves soon kills the tree. Melting is done slowly over an open fire and if a chalky wax is desired, a small quantity of water is added to the dust. Much of it, however, is melted without water and a hard, brittle product results. Melting is a condensing process and five gallons of dust melts down to less than one quart of molten wax. The molten material is filtered to remove the fibers and other parts of the leaves which naturally get into it. The solidified wax is then

graded and packed into bags woven from the palm leaf fibers.[4]

At frequent intervals during the dry season native buyers visit the areas of production and contract for the wax. Generally a down payment is made in cash and the balance paid upon delivery at the port. The poor method of grading of the wax makes this practice of holding the final payment until the delivery is made, a necessity. The ports of Fortaleza and Parnahiba handle the bulk of the export of carnauba wax. Small donkeys continue to be the chief means of transport to the shipping centers. At the ports the wax is repacked in burlap bags, each bag containing about one hundred to one hundred twenty pounds.

In 1940 carnauba wax ranked seventh in value among the exports of Brazil, being surpassed by coffee, cotton, chilled meats, hides and skins, preserved meats, and cacao in the order named. Approximately two-thirds of the total export of wax comes to the United States and New York is the major port of reception.

Future Developments

Brazilians are attempting to retain their monopoly by prohibiting the export of seeds from the carnauba palm. Naturally one is interested in the possibilities of developing a plantation system for the production of the wax. Some attempts have been made along this line but it is much too soon to predict the results. It is a development to watch and time alone will tell whether the plantation system will succeed or fail in this particular case.

[4] For more complete discussion of the melting process see: Steinle, J. Vernon. Carnauba Wax, Industrial and Engineering Chemistry. Volume 28, pp. 1004-1008.

SOME GEOGRAPHICAL TERMS AND THEIR ENGLISH RELATIVES

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The student of geography who thought that an Equinox is a mythical monster half horse and half ox showed an appreciation of the meaning of words often lacking among those who struggle to understand new and unfamiliar terms. He was on the right track and it is for him that I have compiled the following list of words. It seemed to me, while preparing this list, that I would deprive the reader of considerable pleasure, were I to plunge into an explanation of these words at the outset. So I have imposed upon my good friend, the *Editor* of this JOURNAL, and asked him to use his ingenuity to isolate this list from the text which follows in order that it may be studied first. It is a kind of quiz. I have placed together pairs of words which are related to each other in the belief that the inquiring student may like to test his acumen and understanding of geographical terms, by pointing out what the two words have in common. One of each pair is a geographical term; the other is a word of more familiar usage. I have given you 50 pairs, and if you are a person who likes to keep a score of such matters, you can readily rate yourself on a percentage basis. I do not know what par should be in a contest of this kind, but I should be glad to hear from any of my readers who would take the trouble to tell me what records their students make, giving me at the same time the student's place in school. At a later date, I shall gladly make a report of what may have been discovered in this way, tho it will perhaps have no pedagogical significance. It is, of course, apparent that the list contains only those geographic terms which have close relatives among our common words. Once this relationship is pointed out, the terms themselves should take on a greater appeal and might even elicit some enthusiasm on the part of students inclined to be apathetic to these matters. Finally, let me say that it would be most unbecoming on my part to presume that I have contributed anything new to the geography teachers of the country. I am sure that vast numbers of them must have done this very thing. It simply occurred to me that it might be handy to have it in this form.

Geographical Terms	*Related English Words*
1. Geography	George
2. Tropic	trophy
3. Capricorn	caper
4. Cancer (The Tropic)	cancer (the disease)
5. Zodiac	electrode
6. Planet	plankton
7. Astronomy	disaster
8. Perihelion	heliotrope
9. Orient	origin
10. Occident	cadence
11. Horizon	aphorism
12. Latitude	bilateral
13. Parallel	alias
14. Pelagic	archipelago
15. Epeirogenic	Epirus
16. Mesopotamia	hippopotamus
17. La Plata	Platinum
18. Champagne	scamp
19. Legend	legible
20. Datum	date
21. Scale	escalator
22. Climate	climax
23. Barometer	baritone
24. Profile	filament
25. Line	linen
26. Topography	topic
27. Levee	levy
28. Aggrade	graduate
29. Detritus	detriment
30. Abrade	razor
31. Erode	rodent
32. River	arrive
33. Rivulet	derive
34. Anastomosing	stomach
35. Fluid	Coblenz
36. Estuary	estivate
37. Cape	precipice
38. Crevice	decrepit
39. Schist	schism
40. Granite	grain
41. Lava	lavatory
42. Diamond	adamant
43. Calciferous	calculus
44. Hematite	haemorrhage
45. Psilomelane	melancholy
46. Amphibole	symbol
47. Tetrahedron	cathedral
48. Lapidary	dilapidate
49. Pelecypod	pelican
50. Clepsydra	cleptomaniac

1. It may be surprising to discover that the man's name George comes from the same root as geography. The Greek root *ge* means the "earth." When Vergil wrote his book called the *Georgics,* he was writing about farming, for the word George means a worker in the earth. Besides *ge,* it includes the root *ergein* meaning "to work," a root found also in energy, erg, metallurgy, and surgeon.

2. The word Tropic means "to turn." It is the point where the sun turns in its northward or southward course and moves again toward the equator. Other words employing the same root are tropism (used in botany to indicate a tendency to turn, as for example geotropism) and allotropic (used in mineralogy to describe minerals which have more than one form). Then there is the word trophy, originally applied to a monument erected on the field of battle to commemorate the place where the enemy was "turned" back. It now connotes any reward for success.

3. Capricorn is the constellation of the Goat's Horn. *Capri* means goat. To caper is to frisk about like a goat, to be capricious. *Corn* means a horn, as in cornucopia, the horn of plenty.

4. The Tropic of Cancer is named after the constellation of Cancer the Crab. Cancer means "that which crawls." A crawling or running ulcer is a cancer.

5. The Zodiac is the band of constellations in the sky, made up largely of animals, for the word means "the animal way." *Zo* means animal and *odos* means a way. An electrode is the way or path followed by an electric current.

6. A planet is a "wanderer" in distinction from the fixed stars. So also is plankton, which is the minute life that drifts and floats on the surface of the sea wafted hither and yon by the currents.

7. Astronomy, the study of the stars, is a science but there was a time when astrology took its place and presumed to guide the actions of people in accordance with the movements of the stars. Those who did not listen to its teachings courted "disaster." They acted "against" the (advice of the) "stars."

8. Perihelion means near to or around the sun and pertains to that part of the earth's elliptical orbit which is nearest to the sun. The analogous term perigee relates to the moon when it is nearest to the earth. *Peri* means near to and *helios* means "sun." A heliotrope is a flower which turns toward the sun, for we have already seen that a tropism is a turning.

9. The Orient or the East is the place where the sun rises, from *oriri,* to arise. So also originate and origin means to arise.

10. The Occident or the West is the place where the sun sets or falls. A cadence (from *cadere, cidere*) also is a falling or a descent in tone to a lower pitch.

11. The horizon, from *oros* a boundary, means the limit of one's vision. An aphorism is a short succinct statement sharply "bounded off" or delimited.

12. Latitude, referring to distances north or south of the equator, was originally applied to the north-south dimension of the Mediterranean region which was then the only known part of the world. Its length or longitude was east and west and its breadth or latitude was north and south, from *latus,* meaning broad. Bilateral meaning two-sided comes from the cognate root *latus* meaning a "side."

13. A parallel (of latitude) is an interesting word. It means literally "alongside another and another." *Al* (or *el*) means another. An alias is "another" name for somebody.

14. An archipelago, we know, is a group of islands but the word really means the "chief sea." We have the root *arch,* "chief" in such other words as archdeacon, and architect. *Pelagos* means "sea." The name archipelago was first applied to the Aegean, the "chief sea" of the Greeks. Later it came to mean the islands in that sea. Pelagic means "relating to the sea." We speak, for example, of pelagic or deep sea life.

15. Epeirogenic is a term used in geology for earth movements which cause "continent-building" for that is what the word means. *Epirus* means "continent" Epirus is the mainland of Greece.

16. Mesopotamia, "between the rivers" is the region lying between the Tigris and the Euphrates. Hippopotamus means "horse of the river." *Hippus* occurs also in hippodrome. *Potamus* (meaning river) is indirectly allied to the Latin word *potare,* to drink, which is found in the words potation and potable.

17. La Plata means silver. The expression silver plated is, therefore redunant, but is necessary because the word "plated" is now used with reference to any metal. Platinum was so named because of its resemblance to silver.

18. The names Champagne (in France) and Campagna (in Italy) as well as campaign all come from the root *campus,* meaning a field. A scamp, from *ex* plus *campus,* means "away from the field" and was a term once applied to a soldier who ran away from the field of battle. A similar word is sluice which comes from *ex* plus *clusa* and means "out of an enclosure," that is a canal or drain leading out from a dammed-up body of water.

19. The word legend comes from the Latin *legere,* "to read," and means literally "that which is to be read" tho often the legend is the last part of the map to which we give any attention. Legible, of course, means readable.

20. Datum is another word often appearing on maps in some form as: "Datum is mean sea level." Datum comes from *do, dare, datum,* "to give." It might be translated as "that which is given or fixed" or "the starting point." The word date is also derived from this root, this piece of information being given or fixed on important legal papers.

21. The scale of a map with its little cross bars sometimes looks like a ladder. *Scala* means "ladder." An escalator is a moving ladder. This, by the way, may help you to avoid spelling it esculator, which has another meaning.

22. It was once thought that the earth "sloped" from the Equator to the poles, and so had different zones, or "climates." *Clima* means a "slope," a root which appears again with a similar meaning in the word "climax," the end of the slope.

23. A barometer is an instrument for measuring the weight of the atmosphere. It comes from *bary,* meaning "heavy." A baritone is a man with a "heavy" voice and barytes is a heavy mineral.

24. The profile of a mountain or of a stream is its outline. It comes from the root *filum* meaning a "thread" or "line." We find it again in the words file, defile, as well as in filament.

25. The word line comes from *linum* meaning a "line" or thread of flax. So also come linen, lingerie, lint, linseed, and linoleum.

26. Topography as now used has reference to the relief features of a map, but the word really has to do with position. It comes from *topos* meaning a place. Topical also means "with regard to a place" and a topic is something about a place or perhaps a thing.

27. The relief of a country is its ups and downs. It comes from *levare,* to raise. We levy a tax to raise money and a river raises a levee along its bank, and we all know what a lever is used for. How do you suppose the the Levant got its name? Remember, it is in the East, the place of the rising sun.

28. Some rivers aggrade their courses. They build them up. *Gradus* means "step." There are grades or steps in school, and when we graduate, we step out.

29. The detritus with which a river aggrades is something that has been worn off of the country. It comes from the Latin verb *terere, tritus* meaning to "rub," or wear away. Things that are

rubbed long enough become worn, and expressions or sayings which are said too often become "trite" or worn out. A detriment is that which has been rubbed off a person causing him to be deprived of something, and a contrite heart is one that has been rubbed until it has become worn out and subdued.

30. And speaking further of rubbing, we say that rivers "abrade." *Radere* means to "scrape," an idea familiar to those who use "razors." To raze is to rub down or scrape away.

31. To erode means almost the same as to abrade and comes from a cognate root. It means to gnaw. A rodent is an animal that gnaws, and to corrode is to destroy by gnawing or eating away.

32. The word river comes from the Latin root *ripa,* meaning a bank or shore. Riparian rights are shore rights, you know. Eventually *riparia* came to mean a "river" and in time was corrupted into *riviere* (p's, b's v's, and f's are often interchangeable, you may have noticed in many other cases). This is the French word for river, whence comes our English form. "Riviera" still means a bank or shore. Arrive means to come to the bank, and rivet means to tie up to the shore, or fasten.

33. Rivulet comes from quite another root, namely *rivus,* meaning a little stream. Derive means to draw off water thru a little channel or rivulet from a larger body of water. So, in the same way, we make the meaning of one word flow out of another and this is "derivation." And who are rivals? They are people who live on the same brook or rivus, and must therefore compete.

34. Rivers which have many intertwining channels or outlets are said to be braided or anastomosing. A *stoma* is a mouth or stomach. Stomata are the minute pores or mouths on the leaves of plants thru which they "breathe."

35. A fluid is something which flows, from *fluere,* "to flow." The confluence of two streams is the junction or place where they flow together. The city of Coblenz stands at the junction of the Rhine and the Moselle. The Romans called it Confluentium, but now with the "f" changed to "b" it becomes the German Coblenz. Fluorite is a mineral, the fluoride of calcium. You might wonder how fluorite has anything to do with flowing. It was once used as a "flux" to promote the fusion of refractory minerals, just as limestone is used.

36. An estuary is an arm of the sea and is likely to have many seething and swirling currents. The word comes from *aestus,* meaning a surging or boiling, or a "heating." The same root appears in "estivate" to "spend the summer," the opposite of hibernate.

37. A cape (*caput,* meaning "head") is a "headland." Precipice is from the same root. It means abrupt, headlong, or precipitate.

38. A crevice is a crack. The word comes from the root *crepare,* to break or "crack," whence we have also decrepit, meaning broken or cracked, and crevasse, a deep fissure.

39. A schist is a finely laminated rock which "splits," an idea found again in the word schism.

40. Granite comes from the root *granum,* a grain because of its granular make-up. The mineral garnet uses the same root. Garnets often resemble grains or nuts in appearance.

41. Lava or molten rock comes from the Latin *lavare,* to wash, a root we find also in lavatory, and lave as well as in lavish. To lavish our affections upon anyone we wash him all over with love.

42. Diamond, the hardest of minerals, comes from a root meaning hard, which appears also in the word adamant, untamable.

43. Calciferous (from *calx, calcis,* "lime") means lime-bearing. A calculus in Latin was a little pebble, naturally a lime pebble because limestone is so prevalent in Italy. In those days people used pebbles to count by and this was called "calculation." Calculus, nowadays, however, requires more than pebbles for its mastery.

44. Hematite (or haematite) ore is a blood-red mineral, an oxide of iron. Haemorrhage and haemoglobin also use *haema,* "blood."

45. You may never have heard of psilomelane. It is sufficient to know that it is a shiny black mineral. We find the same root in melancholy which also means black but in a slightly different sense.

46. Amphibole is another mineral, perhaps not too well known. In fact, amphibole is often mistaken for other minerals. The word means "doubtful" and comes from *amphi* meaning "around," or "both" and *bol,* to throw." If an idea is thrown around too much, it becomes "amphibolic" or doubtful. In an "amphitheatre" one can see "around" or on "both" sides. An amphibian is "both" land and water-living. Now for the "symbols" such as we find on maps. We know that a symbol stands for something which it represents. Into a purely arbitrary form we "throw" the meaning of the object itself. Symbol comes from *sym,* "together" or "with," and *bole* to "throw" also found in hyperbola, and catabolism.

47. We have just mentioned several kinds of minerals. Most of them occur in some crystal form. One of these forms is the tetrahedron. There are also octahedrons and dodecahedrons. *Hedron* means a "seat" or base. A tetrahedron has four "seats" or sides.

A cathedral is a place to sit down. It comes from *hedron,* a seat, and *cata,* down, found also in calalysis and catastrophe.

48. A lapidary is a man who deals in precious stones, that is, a jeweler. *Lapis,* a stone, we find also in *lapis lazuli,* and in dilapidate. Dilapidate means to turn into stones. Originally used in reference to disintegrating walls and buildings, it has now come to have a somewhat wider meaning and concerns anything going to pieces.

49. Pelecypod. Geographers occasionally encounter some of the less familiar terms used in biology and paleontology. You are already familiar with pelecypods under the name of clams and oysters. The word means "hatchet-footed," from *pelec,* a hatchet, and *pod,* meaning foot. Pelican uses the same root *pelic* (meaning "hatchet"), for a pelican is a hatchet-billed bird.

50. If I tell you that a clepsydra is an ancient water-clock in which the water dripped slowly from a hole at the bottom, and that a cleptomaniac is one who has a propensity for pilfering, you would hardly suspect any connection between these words. Clepsydra really means "stealing-water." The "ydra" part you detect again in hydrant, and other similar words, and *clep* means "stealing." Cleptomania is a mania for stealing.

Analemma—dilemma. And now for good measure we give you still another pair which we would hardly expect you to decipher, but which you will doubtless find of interest. An analemma, you may remember, is the 8-shaped figure placed on the outside of a globe, usually somewhere in the Pacific Ocean. Never mind now just what it is for. Only remember that it has the shape of the figure 8. A dilemma is a quandary where you are faced with the necessity of choosing between two propositions. You might rack your brains forever and never guess the connection between these two similar words. *Lemma,* from the Greek word "to take," means a thing taken for granted, a proposition. A dilemma then means two propositions. Analemma means to take up. *Ana* means up, and appears in many other words like analysis and anachronism. An analemma is so named because in shape it resembles a sling used to support or "take up" a wounded arm.

And in closing let me ask you if you can think of a better motto for a geographer than the term "ubique" which is on the seal of the American Geographical Society? You have only to remember the English word "ubiquity" and you will know what ubique means.

A TRIP THRU PALESTINE*

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WE ENTER PALESTINE AT JAFFA

Let us imagine that we are to visit Palestine or the Holy Land, as it is called by Christians, Jews, and Mohammedans. To do so, we get on a ship bound for a Mediterranean seaport called Jaffa. Since the harbor of Jaffa is neither deep, nor sheltered from the storms of the sea, our ship is anchored a short distance from the dock. We therefore leave our ship and go to shore on a small boat sent out to meet us. This boat and several others like it bring boxes of oranges to our ship. These oranges were grown nearby and are to be sent to the London market. If oranges grow near Jaffa, can you tell what kind of climate this coast has?

THE HOLY LAND HAS ONLY TWO MARKED SEASONS

The climate in the Holy Land is such that the people can spend much of their time in the open air. There are really only two seasons: the rainy and the dry season. From May to October almost no rain falls. During this season the land is hot and dry. Unless it is irrigated, the land is mostly barren. Rains fall at various times from November to April. Then the pastures and fields produce grass and crops similar to those grown in California.

WE LEARN ABOUT THE COUNTRY OF PALESTINE AND HOW THE LAND IS USED

We are surprised at the small size of this land as we go eastward by automobile from Jaffa. A man on our steamer told us that in an automobile we could drive across the country of Palestine in about an hour or two. He also told us that most of this country is mountainous and hilly. We notice that along the Mediterranean Sea the narrow coastal plain has some fertile land, part of which can be irrigated with water from wells. East of it there are hills

* The material in this article was gleaned from readings of a variety of sources. It is intended for the elementary grades. The approach to this unit of study may be thru conversations based on news items, music, art, pictures, articles brought from Palestine, and Christmas programs. The method of presentation used is left to the teachers. It is hoped that a number of topics for special reports and activities will be suggested as the study progresses. Part of the unit could be dramatized. The unit has been presented with success in our laboratory school.

which are a few thousand feet high. Among them are a few fertile valleys. The hillsides usually have barren rock with scanty grass and shrubs on which goats and sheep graze. We see no forests in Palestine. As we go along, we see that the fertile land is found in the valleys. There farmers raise wheat, barley, vegetables and fruits. Some parts of the hill country of central and northern Palestine are laid out in terraces. Grapes, olives, mulberries and figs are raised there, if water from wells or springs is available at times for irrigation.

The southern part of Palestine is very stony, barren, almost a desert. There the people usually have no other home than a light-weight tent of goat hair, which they move along with their herds and flocks. They must move to another pasture when there is no more grass and shrubs for their sheep, goats or camels. In olden times the families moved on foot or on camel or mule back. Now they may move in an American automobile! Their clothing, however, is still very much as it was in biblical times. Can you tell why this clothing is suited to this climate?

Most of the farmers and shepherds living north of the desert area live in houses made of stone or sun dried brick, with a dome-shaped roof to shed the rain. Let us visit one of these homes in which a shepherd boy, named Essa, lives.

Essa's Home Near Bethlehem

When we arrive there in the afternoon Essa is not at home because he is herding the sheep. So we will not meet him till evening. It is the custom that the youngest boy of the family tends the sheep as soon as he is about nine or ten years old.

As we enter Essa's home we see just one large room. This is divided into two parts. The family lives in the part which is raised like a platform. When it is cold the animals occupy the other part and also the part under that where Essa lives. You see this one building is both house and barn.

This room in which Essa lives serves as a kitchen, bedroom, living room, and storeroom. On one side of the room there is a fireplace used for cooking. A straw mat or heavy woolen rug covers part of the floor. In an opening in the wall, mattresses, thick quilts and hard pillows are kept during the day. At night they sleep on this bedding spread on the floor. On the other side of the room is a row of bins made of sun-dried clay. In these are kept the supply of

wheat, barley, figs, and raisins. Behind these bins, fodder is stored for the animals.

Essa's mother has only a few cooking utensils. She has a clay cooking pot, a large wooden spoon, a few wooden bowls, and a small brass coffee pot and some tiny coffee cups. The whole family eats from one large dish by using their fingers and small flat pieces of bread. The main meal, which is served in the evening, often consists of lentils, rice or wheat with vegetables and perhaps a little meat.

Essa's father works in the fields raising the crops. The older boys in the family help their father with the sowing, reaping, and the threshing. Essa, the youngest boy, we remember, tends the sheep all day long and sometimes at night. The women grind corn or other grain for bread, wash the clothes, and do other housework. They carry water in big jars which are balanced on their heads. Toward evening, the children go to the bakery in the village with pieces of broken pottery in which they get a few hot coals with which to cook the evening meal.

THE CLOTHES WORN

Most of the people of Palestine look very different from people we are used to seeing. One reason for this is the kind of clothing they wear. The women have very colorful clothes. They have linen dresses called "tobes." The tobe is a long loose shirt with a belt of bright striped silk. The tobe is pulled up to make a blouse. The sleeves are wide at the bottom like the Japanese sleeves. Because the peasant women wear a cap and veil made of white linen over their heads most of the time, very little of their hair is ever seen. A small shirt is the babies' only garment. Around this some cloth or rags are wrapped. When the mother goes outside the house to work she carries the baby in a hammock on her back.

The men also wear a tobe, but they have a heavy bright-colored jacket with a leather or wool belt over it. Covering this is a coat of coarse cloth that comes down to the knees. This coat is made of just one piece of cloth with two openings for the arms. At night the shepherds use it for a quilt and on rainy days they put it over their heads because it sheds the rain.

On their heads, the men always wear turbans. These are made of large square pieces of white linen with colored border and are wound about their heads.

The shoes of both the men and women are very crude. The tops

are a bright red or yellow sheepskin. The soles are made of cow or camel hide. When the roads are muddy the women sometimes take off their shoes in order to save them and put them in a basket on top of their heads.

Little boys are dressed like the men except for the head dress. They do not get a turban until they are twelve years old. When the father gives his son a turban, the little boy feels very important and grown up.

Essa Comes Home with His Sheep

Toward evening we hear the bleating of sheep. Essa is coming home with his flock. He leads the sheep and does not chase them as we do our animals. The sheep follow him and know his voice when he calls them.

Essa carries a light stick or crook. He has a sling made from long wool to help him get stray sheep back into the fold. Over his shoulder he has a bag in which he carries his lunch of bread and olives. He also has flint, steel, and tinder for striking a fire. Essa enjoys his work. He even plays some music for himself on the flute he has made of reeds.

As we watch Essa and his sheep we try to picture these same rocky hills as they must have looked on that first Christmas Eve, so long ago, where the shepherds were keeping watch over their flocks by night.

We Visit the Holy City

When we leave Essa's home we travel northward to Jerusalem. It is only five miles from Bethlehem. Jerusalem is located high up on the east slope of two large hills.

Jerusalem is said to be built in layers. It has been fought over many times, destroyed, then rebuilt on the ruins. Where Solomon's Temple once stood, today we see the great Mohammedan Mosque of Omar with its large dome. Many other structures are of great religious and historical interest.

As we pass through the streets we notice the different kinds of people. We see Greek priests in black robes and tall hats. There are peasant women in cotton clothing, and dark-eyed Arabs in flowing robes. We also see Jews in coarse loose coats. Some moslem ladies in silken garments and veils are walking thru the streets. Besides all these there are people dressed just as we are.

Jerusalem is really made up of two parts—old Jerusalem and new Jerusalem. The old part is still much as it was in the time of

Christ while the new is much like a modern city. Jews from other parts of the world have come to Jerusalem and other places in Palestine to make it their homeland.

Many people live and visit in Jerusalem because the city is sacred to Jews, Christians and Mohammedans. Each group may practice their own religion, but they are not always at peace because there is much jealousy and misunderstanding among them.

Many Jews wishing to develop a modern city have built a beautiful new city just outside of Jaffa. This city is called Tel Aviv. Jaffa is an old city and most of its people are Mohammedans or Arabs.

We Go to the Lowest Spot on Earth

If we travel eastward from Jerusalem we get to the Dead Sea. A steep road leads down thru yellowish hills with no green thing in sight and the air is very hot. The shore of the Dead Sea is 1300 feet below the level of the Mediterranean Sea. Besides this the Dead Sea is also very deep. The sea is clear but lifeless. The water is so bitter that no fish can live in it. It is much saltier than the ocean, about six times as salty. The Jordan River brings fresh water into the sea but the mountains hem in the sea on every side so that it does not have an outlet. Under the hot sun much of the water evaporates causing the Dead Sea water to be very salty.

Some of this water is pumped into shallow vats or pans. As the water evaporates in the hot sunshine, the salts settle in the pans and are hauled over the same road on which we traveled from Jaffa. At Jaffa, these salts are sent into world markets to be used as fertilizers and chemicals.

The Jordan River which empties into the north end of the Dead Sea is the longest and most useful river of Palestine. It forms the eastern boundary of the Holy Land. The river flows in a deep and narrow trough which it has dug for itself in the course of centuries. The stream twists and bends so much that it is about three times as long as the distance between its source, the Sea of Galilee, and its mouth.

Because the current of the Jordan is swift, part of its waters are now used for power to develop electricity. Also, some of this water is used for irrigation.

We Enjoy Seeing Nazareth, The Fair Flower of Galilee

We shall stop at one more famous spot before leaving Palestine. This is Nazareth. The road to it climbs steeply in a number of

sharp bends until it reaches a high level piece of land. The town is built partly on this level but many of the houses are in rows on the steep sides of the hills. Nazareth is especially beautiful in the springtime of the year when the flowers bloom. The name "Nazareth" means flowers, a pleasing name when we remember that in this town the Christ-child lived. This town has not grown very large because of the shortage of water, and because it is surrounded by hilly lands with poor soils.

We Leave Palestine

From Nazareth we travel westward to Haifa, the new seaport of Palestine. Haifa is quite a busy city because it is a seaport and also has a few factories. Most of the visitors of the Holy Land leave from here. Also many oranges are shipped to other lands from this harbor. What other place that we visited in the Holy Land ships oranges? Nearby is a pipe line which brings in the oil from the oil fields near Baghdad in Iraq. Find this on your map.

We are happy to see one of our own American ships in the harbor waiting to take us on our journey to other distant lands. We regret that time did not permit us to visit a railroad or air port which we passed. Maybe you will wish to find out where the air planes and trains go and what service they render Palestine.

GEOGRAPHY ASSIGNMENTS AT THE COLLEGE LEVEL*

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I consider it an honor to be assigned such a subject, because what one may think or say about such a topic is largely personal. In other words, any similarity to other persons, places, or events is purely coincidental.

MEANING OF ASSIGNMENTS

Out of curiosity I thumbed my dictionary to find out just what assignments are. The first and thus basic definition is "1. The act of assigning, in any sense, or that which is assigned;—etc." Pursuit of assign as a verb revealed "1. To set apart for a particular use—. 2. To point out with precision; particularize; specify; determine; set. 3. To account for with reasons; ascribe; attribute—." I have not presented these definitions to be technical, or to be pedantic, or to split hairs, but to emphasize the necessity of something that may be assigned worthy of the level of intelligence of the assignee, in this paper the college student level.

One type of assignment which may be dismissed briefly is the preview type in which the teacher, or assignor, reveals the next day's classroom work—whether it be recitation, text book, or lecture. To me such assignments are futile for the simple reason that students in common with the rest of humanity seldom learn much by foresight. Hindsight seems to be the best teacher in the school of experience. Furthermore, such assignments instead of creating interest in what is to be done, rather dull or make stale the new work. The student does not study with the zeal and zest of finding out something worthwhile for himself.

OBJECTIVES OF ASSIGNMENTS

We are considering geography assignments. What is worthwhile in geography? Year by year I have become more and more convinced that geographic data, geographic facts do not constitute the lure of geography. How often, but not too often, have we heard Charles Colby say in substance that there are many experts in many fields of science and humanities who have at their finger

* Presented at New York meeting of National Council of Geography Teachers, January 1, 1942.

tips, so to speak, far more accurate information than we geographers, but how few of them have developed the ability to correlate or synthesize that information. Continuing he would add, "the great contribution of geographers is that point of view, that philosophy which enables one to correlate and synthesize." How many of us have turned to our teaching with greater resolves to do just that!

Our subject matter lends itself to such methods and techniques of teaching. To correlate, to synthesize require mental alertness. To correlate, to synthesize require data, facts, information. How are we to handle these two jobs?

SIGNIFICANCE OF FACTS

I am well aware of the fact that there are many of my colleagues who take the easy way of pouring facts or pounding facts into students. The tendency is to expect that the students will do the thinking by themselves; i.e. discover for themselves the objective, the reason for learning the facts. Such a procedure is common in our schools. The students' goal seems to be to learn more facts. Such attitudes hamper us in teaching a philosophy. The students have difficulty in appreciating the fact that you are presenting concepts, methods of analysis, and techniques of synthesis. At the beginning of each course and at the beginning of each phase of each course, I endeavor to visualize the reason why, the idea behind it all. Experience has led me to suggest and at times insist that the students take a few notes on the introductory lectures. If one does not insist, most students sit calmly waiting for the course to begin—namely, the outpouring of facts. When the facts come, they feverishly write with smug assurance that now, finally, at last, they are learning something.

I do not minimize the value of knowing geographic "whats," geographic "wheres," or even stereotyped geographic "whys." You know. What is the latitude of Moscova? What country grows the most wheat? Where is the Amazon? Why do Eskimos wear fur clothes? Why do monkeys climb trees? In my opinion such facts, if they are worth remembering, are in the elementary and secondary level. Why should the college level serve geographic hash to its students? If the students do not know them, let us present them at their intelligence level. My observation of some elementary teaching indicates that in too many instances the teachers are trying to put across concepts which their pupils are incapable

of understanding and are neglecting the facts and ideas within their mental scope.

Student Reaction

I have found that students like to demonstrate their ability to apply ideas to situations, particularly if the task is presented as a concrete practical job. These various jobs bring out different talents from different students. I now wish to present a few exhibits as illustrations. Before such a group as this it is not necessary to go into all the data or material evidence in each case. My purpose is to suggest to you at this time qualitative concepts.

Exhibits

Exhibit A. Draw and label a population curve which reflects the stages of sequent occupance of Java.

The purpose of this problem is to put in graphic form the student's conception of the population aspects of stages of sequent occupance. It is based upon the general principle that each job or occupation requires a characteristic number of people to carry it on. The population value for a given stage would be the aggregate of the various occupations of that stage. The result will be a series of steps toward a plateau of population saturation which now exists in Java. The stages are the native Milpa, the trading post, and the plantation. Each of these stages represents successively increasing totals of population.

In this way the student analyses and understands the composite effect on population of man's use of resources in the development of geographic places. It is obvious that with the great diversity of types of evolution of the many places of the world that this kind of a job has almost unlimited possibilities.

Exhibit B. Draw and label a geographic cross-section from Bombay to Calcutta. The object is to assemble the specific elements of given geographic complexes in their proper space relations. In this assignment four regions are contrasted—Malabar, Deccan Cotton, Deccan Rice, and Ganges-Brahmaputra. All the elements, natural and cultural, should be indicated graphically or represented by symbols and labels. (Some students understand but are not artistic. Some students are artistic but do not understand.) In this manner the relationships between natural elements and natural elements, between cultural elements and natural elements, and between cultural elements and cultural elements may be described, analyzed or explained.

Exhibit C. Outline or write a short novel, "The Saga of an Ozark Family." The objective of this job is to personalize the life of the stages of sequent occupance. I generally refer to the famous "Forsythe Saga" by John Galsworthy to give literary class to the assignment. Then I suggest "American Beauty" by Edna Ferber, or "With a Lantern in Her Hand" by Bess Streator Aldrich. I suggest that the story begin with a young married couple moving into the region in its pioneer period. As the family grows from generation to generation the co-ordination with increasing complexity of the stages demonstrates the students' feeling for the geographic relationships of the sequence. The creation of characters for the saga which are appropriate to the times, and environment, excite real enthusiasm.

For those not creative, books of the saga type may be named, with the job to analyze the story into its geographic parts.

Exhibit D. You are to draw up comparative cost sheets showing costs of production of iron ore at Hibbing, Birmingham, Moa, and Cruz Grande. This job is based on the idea that one of the objects of industrial geography is to study how a commodity is produced in the principal type areas. This study requires a correlation of operations with the conditions of mineral occurrence and geographic environment. The principal conditions of occurrence are depth, shape, position, composition, texture or state, and grade. The geographic environment aspect involves economic adaptations to climate, water resources, native vegetation, industrial economy and stage of industrial evolution. By means of comparative costs, students may realize the actual economic significance of geographic conditions and locations.

Exhibit E. Analyze geographically the picture, Fig. 40, page 100. The key to this job is an understanding of the meaning of geography. The first step is to list the landscape elements in the picture, visible, and invisible but involved. The second step is to compose these elements in statements indicating the geographic relationships existing between them. The full illumination of this job may require readings concerning the nature of the unseen phenomena involved. By this method the student learns to observe, to analyze what he sees and to formulate his own statements of what he sees and learns.

Exhibit F. Construct a flow-sheet showing the production of wood pulp at Three Rivers, Quebec. The object of this job is the correlation of the successive operations of logging, transportation,

and milling and the geographic conditions involved at each step. The methods of logging are what they are because of the type of forest, and the type of climate. The methods of transportation are related to climatic conditions and drainage features. The milling is related to water power and ocean navigation. Each of these elements should be diagrammed specifically in the flow-sheet. Thus the particular aspects of the elements of the geographic complex are spaced and related to specific operations.

Exhibit G. Draw a conventionalized unit of design typical of the United States Corn Belt Region landscape. The object of this job is to aid in the appreciation of geographic landscapes. The attention is focused on the functional relationships between farms, towns, cities, and transportation facilities. One objective is the quantitative significance of the various cultural units in the landscape. The theme of regional geography is the general continuity of distribution of units of design thruout the area of the region, like the motif of dress goods or wall paper.

Exhibit H. Draw the structural pattern of the geographic landscape of the Great Plains Region. This job is an outgrowth of the unit of design job. The focus of attention is shifted from the unit to the specific features of the region as a whole. The actual drainage pattern of the region determines the actual distribution of the units of design. This type of job induces the realistic study of actual regions. In other words the students deal with particular rivers, particular cities and towns as they actually exist.

Exhibit I. Draw a dot map indicating population density distributions in the Amazon region. The object of this job is to utilize the same principle as in Exhibit A; namely, that each job or occupation requires a typical or characteristic number of people to carry on that occupation. A dot map of a geographic region therefore reflects the population requirements areally and thus brings out the human aspect of the unit of design in the regional pattern.

Exhibit J. Write a travel prospectus for geographers, taking a trip from New York to Buenos Aires to Santiago, Chile to Panama back to New York. The schedule of stops for such a project may be obtained from any steamship or tourist agency. The object is to direct the student in picking out and appraising geographical features and phenomena along the route. In a way it is a scenic, geographic traverse. Such a project may be written in a diary form and thus bring out the individual reactions to what they learn

about a trip over such a route. It is amazing to note the lack of co-ordination which students have at the beginning between general principles studied in the text and lecture and how they would be observed in the actual situations.

Conclusions

I have found that it takes practice to learn how to apply ideas and methods. My method is to present a topic in such a manner that the student not only learns some facts, but also is exposed to a method of approaching similar situations, to think geographically about them. The first step is to state the assignment as a job. The second step is to explain the principle involved or the objective to be attained. The third step is to demonstrate the technique by miscellaneous examples. The fourth step is to have students perform the job for an "unknown" situation. The fifth step is to grade the performance. The sixth step is to analyze and discuss the performances in class (like the "post-mortems" coaches have on Mondays with their football teams). The seventh step is to repeat with another unknown. The eighth step is the use of the assignment as a type question in formal tests or examinations. Thus, the assignments have a definite place in the procedure of teaching geography and are not just to create busy-work.

PROBLEM SOLVING IN CLIMATOLOGY

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It is a cardinal point of modern education that the things learned and the specific skills attained are frequently subordinate in importance and student value to the process which inculcates them. This should be true in senior high school and college as well as in the grades, for it can not be disputed that a large portion of the academic dividends accruing at college level result from thinking and doing rather than from having thought and having done. Whether the student later enters such divergent fields as science, literature or religion, his early concepts must stand reorganization in the light of graduate study and fresh evidence; but the ability to reason, by which such concepts are worked out, should require no metamorphosis. It becomes a lifetime tool, applicable in any field, and grows in proportion as the problems on which it feeds are skillfully and abundantly supplied.

By the same token no particular field can claim exclusive supremacy in developing logical methods of thought. Disciplines differ, and an understanding of the discipline is essential to successful manipulation of ideas; but problem-solving ability is no respecter of pedagogic pigeon holes. Every field has its examples. The following briefly sketched questions from climatology have been used by the writer in college classes to discover and eliminate "fuzzy thinking." Even if no difficulty is experienced in arriving at a conclusion, the student explains the procedure step by step for the benefit of the group. Exactly here is the meat of the matter for each has an opportunity to check himself and, incidentally, the teacher. Occasionally a student will object to the correct sequence of a classmate—a happening which gives considerable insight into the efficacy of previous teaching. Any basic information asked for by the class is given equivocally but freely, for it is assumed that they will not always possess sufficient background. Knowing what to ask for is part and parcel of the problem-solving skill and each question should be rated in value by the teacher at the end. The whole process appears to interest the class and creates a higher-than-average degree of alertness.

I

On some of the higher mountains in the tropics it is not un common to find night temperatures below freezing, but never snow.

How is this possible? To many people, both old and young, snow connotes only low temperature; the existence of sufficient moisture in the air is not necessarily a concomitant idea. Therefore we must inquire the reason for the low thermometer first and let the moisture problem solve itself in the process. Night temperature is largely a function of heat radiation and thereby of the air's blanket effect. If there is sufficient water vapor in the air for precipitation at a temperature several degrees above 32°F., enough heat will be absorbed from the land to keep temperatures above freezing. On the other hand, if air is so dry that the point of condensation is below 32°F., heat loss may be rapid enough to bring freezing temperatures before morning. Therefore, only on those nights which are very dry and clear can the freezing point be reached. Such conditions can occur at elevations which lie between the upper edge of the frost-free zone and the snow line; that is, in the area where lowest temperatures are below 32°F. but above the dew point.

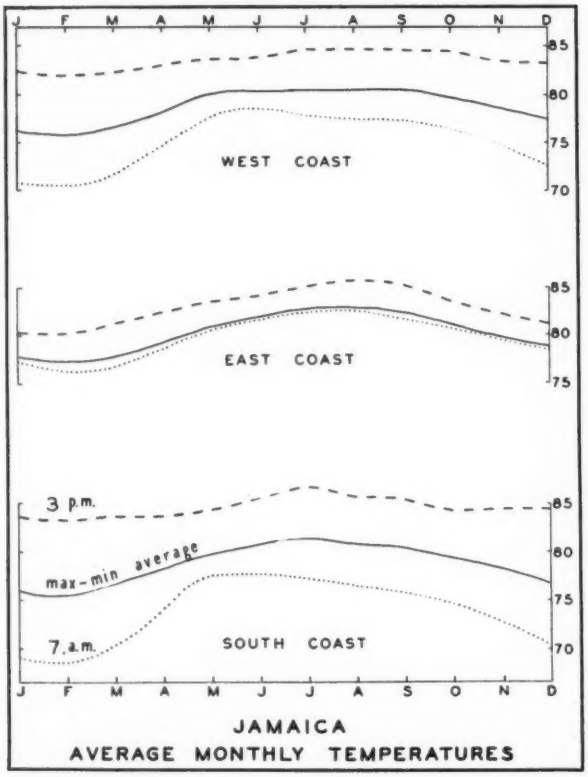
II

A feature well established in the minds of most climate students is the daily march of land and sea breezes on tropical coasts. However, there are times when a complete reversal takes place rapidly, the land breeze blowing strongly in the middle of the day or early afternoon. The explanation of this about-face is not obvious but it involves no catch. A dishearteningly large number of students fail to take the first step: "What are the conditions necessary for a land breeze?" When this has been satisfactorily stated there remains the choice of explaining either a sharp rise in water temperature or a drop in that of the land. The former being quite impossible short of submarine volcanism, there is little left but to hypothecate marked cooling by precipitation a few miles inland. If it were cool enough to snow there would probably have been no sea breeze at first. Convectional rain causes sufficient cooling to create a seaward flow of air which is a welcome respite from the heat. This may be replaced by the sea breeze again after an hour or two of sunshine, or it may grade thru the transition hours into a night land breeze.

III

Recent research on the island of Jamaica has provided several useful questions. A rather interesting one concerns an apparent anomaly between the temperatures of windward and leeward coasts. The island's eastern point has an average temperature of

80.2°F. while the south and west coasts average only 78.6°F. Before attempting a solution of the basis of air and water circulations, the keener students will want to know how the daily figure is determined. Since the formula, T = (Maximum + minimum) ÷ 2, is in common use it is incumbent to explain why either the maximum or the minimum or both are so high on the east. The first is favored by a relatively lower afternoon cloudiness because cumuli are wafted westward by the trades, but continuous importation of sea air from water which ranges from 78° to 83°F. keeps the highest temperatures considerably below those to the west. At night there is insufficient cooling anywhere on the island to produce a strong land breeze — making it easy for the trades to overpower any air which tends to flow eastward. Moist sea air is in control all night and keeps the minimum high even in low-sun months, while on the other side cooling by radiation can take place. A request for the temperatures of other hours clinches the matter: as the graph shows, the 7 A.M. and 3 P.M. curves straddle the average elsewhere, but at the east point the average lies much nearer to the 7 A.M. curve, by which time nearly half the day's temperature rise has occurred, than to the 3 P.M. Temperature changes are rapid soon after sunrise and sunset, but thereafter the change is not great. Maxima differ from minima by only 9°F. in contrast to 15° to 16°F. at the two other stations.



JAMAICA
AVERAGE MONTHLY TEMPERATURES

IV

It is well to remind students of the possibility that even correct information can be misleading and to invite a healthy scepticism of the printed word. As an example, the Philips Climate Map of Winter Conditions (November 1 to April 30) shows 10 to 20 inches of rainfall in parts of Bengal and Assam. The map is not wrong for this rain does fall within the dates set, but it is not a typical winter phenomenon and contrasts strongly with the conditions inferred from the isobars and winds on the same map. What is the source of moisture and what causes it to precipitate? Mediterranean influence does not extend as far east as Bihar and north winds can import little moisture. The legend tells a story of oversimplification—of the inclusion of transition months within the period to which they are adjacent. For this rain comes entirely in April as a result of increasing convection which draws in moisture from the Bay of Bengal, and of the turbulence which follows when warm air rises into cool. It is not to be confused with rain from an early monsoon which could not come so early but, in any event, would show up more strongly on the Western Ghats than in Bengal. This exercise emphasizes the importance of reading legends carefully and of constructing them so that they can not be misunderstood.

V

The implications of weather conditions for sports enthusiasts and maneuvering armies provides several practical questions. One of them involves the famous Alpine winter sports. In Europe the vacationing student is much more likely to try his skiis at Easter than at Christmas time because he then has a better chance of finding sufficient snow. More snow in April than in December? The answer requires a knowledge of pressure distribution and its basic relation to precipitation. Continuous mid-winter high pressure from the Asiatic to Azores centers provides excellent atmospheric conditions on the mountains—clear sky and bright sun—but decreases the likelihood of good conditions underfoot. In December there is still the possibility of rain, but in March and April, when Europe bridges the gap between Equatorial and Icelandic Lows, leaden skies and deep, fluffy snows are more common.

Useful problems are continually cropping up in any class; to have them solved by the teacher is to save time by losing an opportunity. Let him explain as fully as he wishes the more difficult

questions, such as the contrasting rainfall regimes of Fernando Po and Sao Thome which offer many ramifications, and the catch questions which may emphasize important facts but do not increase mental stature. Even when students are pushed to find their own answers the process is too often one of hammering home a few facts rather than of so presenting material that thoughts can not fail to fall in logical order. Is not such training the essence of concept development?

GEOGRAPHY IN A CORE CURRICULUM*

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LAKEWOOD'S CORE CURRICULUM

In the core curriculum, as practiced in our elementary grades, we have an integrated program with geography, science, and history as major subject-matter areas, while the language arts are mainly functional, contributing to and growing from the core.

Geography units are the basis for the core during one-half of each semester, while science and history units occupy the remaining weeks. A larger proportion of time is allotted to geography because very little time is given to this study after the elementary grades.

Each group works with one teacher during the entire core period of two hours. Even tho the teacher follows a schedule for the specific units, she is entirely responsible for the procedure during the core period.

This plan has been in operation for about three years and is quite definitely established. As school curriculums are never static, it may be that changes and re-adjustments will be made in this procedure. In the writer's opinion these changes will probably follow the line of further integration.

It is believed that such a program is beneficial to the child because it lessens the strain caused by too frequent change of subject-matter and teacher. We conserve time by avoiding duplication of effort. Interest in the core subject motivates practice in skill sub-

* Abstract of a paper presented at the New York meeting of the National Council of Geography Teachers, December 31, 1941.

jects, and these, in turn, contribute to the subject-matter area. The needs of the group may be met more completely because of the flexibility of the time allotment. There are greater opportunities for laboratory experiences. The plan is disadvantageous in that it prevents teacher specialization in any one subject-matter area.

The "Core" Idea Illustrated by a Geography Unit

The "core" idea can be further explained by an account of the activities carried on during the study of a unit in geography. In sixth grade geography we are concerned with the study of the countries in Europe and Asia, and Japan was the subject of our first Six A unit. When we approached this study recently, the boys and girls were reading and hearing about the strained relations between Japan and the United States. Starting with their great interest in current happenings, the children were guided in planning problems whose solution would bring an understanding of the elements of Japan's natural environment and the related human factors, thus giving a background for understanding the current happenings.

Investigation of historical facts contributed to an understanding of how Japan's isolation had kept it an agricultural country because of the necessity for self-sufficiency. Investigation of the changes which have come since the opening of Japan's doors brought out many factors relative to its natural environment which have aided it in becoming a world power.

One purpose of our core program is to develop and maintain techniques of general value in the study of content material. This is accomplished by relating geography to the language arts. Our reading program contributed directly to the study of this unit in geography. Part of this reading was extra-curricular in type, such as items from periodicals and daily papers, as well as from school current events papers. Reading assignments were given to gather information needed for solving the problems selected to motivate the unit. Definite techniques and study skills were presented as part of this work-type reading program. They were used as needed and as suited to the material assigned. In carrying out these investigations textbooks were supplemented by other materials in order that our boys and girls might learn to read widely, comparing and evaluating information from various sources.

During all phases of this unit there was much opportunity for

oral expression. In the exploratory period the children gave reports on current events and discussed them. While raising problems, they made observations on maps and statistical data; they reported and discussed the information secured from their reading and from maps and pictures. Other activities which involved discussion were the making of graphs, co-operative outlining, securing and arranging an exhibit, and planning a dramatization.

Written expression, growing out of this unit took various forms such as notes on reading, individual outlines, reports, summary paragraphs, and letters of invitation and appreciation.

Summary

Core curriculum as practiced in Lakewood's elementary grades is a unified program which brings into one learning situation materials that were formerly found in sharply separated subject-matter fields. During a daily period of two hours one subject is the center of interest, but the flexibility of the program permits many types of activities to be carried on within this period. Each unit aims to focus on the attainment of certain understandings, abilities, and attitudes as objectives appropriate to the particular subject-matter area—geography, history, or science; the associated language arts also aim to develop certain skills.

Geography, with its various implications, occupies an important place in the core curriculum and in the life of the child. In working towards a solution of the problems selected to motivate the Japanese unit, the boys and girls acquired certain geographic understandings and abilities. This was in harmony with the direct objectives of the unit core. In the attainment of these objectives, the children gained additional skill in reading and language. Furthermore, they received training in clear thinking, in recognizing problems, and in securing data by which to solve the problems. In estimating the values received from this unit of work, however, one of the most important was an indirect and relatively intangible outcome, namely, an intelligent and favorable attitude toward the problems of another country and its people.

EDITORIAL NOTES AND NEWS

Only recently the guayule shrub has become a star attraction, even tho natives back in the days of Cortez chewed it to get a gum with which to make rubber balls for their games. The shrub is a native of Mexico and Texas, and has been grown successfully in several states, especially in southwestern United States. The extraction of its rubber content is costly, but its chemical composition, according to the Department of Commerce, is not different from that of the rubber obtained from the latex of the rubber tree. Its tensile strength and elasticity is also comparable. Some growers contend that the shrubs should be harvested when nine months old; others advocate a growth period of several years. In the Salinas, California, producing area, yields of pure rubber range from a thousand to three thousand pounds an acre. The Salinas guayule farmer uses an automatic seeder to scatter the seeds on his nursery plot, covers them with a shallow deposit of sand, and then carefully waters the seed bed. After several months of growth, the seedlings are transplanted by special machinery. Harvesting is also mechanized, the plants being uprooted and the dirt beaten off, after which the plants are allowed to dry in the sun. Machines then gather the dried plants, chop them into half-inch pieces, and take them to the mill. There the bits of rubber, or "worms" as they are called, are separated from the woody fibers, washed, and compressed and then sent to the tire manufacturers. Even the harvest of the seeds is done with a special machine which brushes off the seeds and then picks them up with a suction-operating attachment. Seeding begins when the shrubs are a year old. The company operating in Salinas also operates in Mexico and was recently reported to be producing a million pounds of rubber a month.

Due to a marked decline in the sponge fisheries resulting from the war, and a blight which attacked the western hemisphere sponge beds, the price of sponges for 1941 was about 200 per cent higher than that of 1939. The sponging grounds of the United States are in two widely separated areas off the coast of Florida. Divers outfitted with a diving suit and glass-windowed helmet can work for an hour or more at a depth of 150 feet. Their tight-fitting wristbands leave their hands free to cut the sponges from their moorings. After the sponges are brought to the surface, the gelatinous material and sand is removed from the skeletons which are strung, end to end, on a cord about 4 feet 10 inches in length. About 90 per cent of them are sold at auction at the Tarpon Springs Sponge Exchange. Further cleaning, sorting, and trimming of the sponges may then be done by the buyers who in turn sell them to those who are to retail them to the public. It is believed that within a few years the sponge beds will have recovered from the blight, but in the meantime synthetic sponges may offer increasingly severe competition.

"The Work of the Spanish and Portuguese in the New World" is the title of Señor Portinari's four-panel mural which is being painted in the Hispanic Foundation section of the Library of Congress. The Brazilian artist is one of the foremost painters and muralists of the Western Hemisphere. Brazil is meeting half the cost, as a gift to the United States, the remainder coming from the Office of the Coordinator of Inter-American Affairs.

According to estimates recently released by the Bureau of Mines, the 1941 iron ore production of the United States was 92,499,000 gross tons. This was 23 per cent greater than the previous record of 1917. The corresponding steel production also topped past records.

About 86 per cent of the iron ore shipped in 1941 came from the Lake Superior district. Minnesota alone shipped 62,543,000 gross tons. As usual, the Birmingham district led in the south, with an approximate total of 7,951,000 gross tons.

The Nebraska Council of Geography Teachers devoted the December issue of its Bulletin to a series of articles dealing with the issues at stake in the present war. The Nebraska Council is thus furthering national defense by providing information which teachers and pupils may find useful in helping others understand world problems. How many other state councils are carrying on such vigorous, constructive work as the Nebraska Council?

Puerto Rican chemists are investigating coffee flowers as possible sources of perfume oil. The fragrance compares favorably with many oils no longer available from overseas. Since there has been an overproduction of coffee, removal of some of the flowers should prove a benefit to the coffee growers.

The Illinois Bulletin of Geography for December, 1941, features an address by Dr. Alice Foster on the Interrelationships between National and State Councils of Geography Teachers which was given by Miss Foster at the Illinois State Council Meeting at Urbana, November 7, 1941. Copies of the Bulletin are available from the editor, Dr. W. O. Blanchard, University of Illinois.

The annual convention of the N.E.A. will be held in Denver, June 27 to July 2. Those planning to attend these sessions may, if they wish, combine the Convention with attendance at a number of summer school sessions, as well as with vacation excursions to a variety of points of historic and scenic interest.

DR. GEORGE B. CRESSEY, Chairman of the Department of Geology and Geography at Syracuse University, is acting as a consultant at various government agencies at Washington, D.C. He has undertaken assignments for the Weather Bureau and Army Air Corps, the Department of State, Military Intelligence, and Board of Economic Warfare.

Bacon can now be kept fresh for periods up to six months in a new container which consists of a flat aluminum foil envelope with a pliofilm lining. Each envelope can hold twelve half-pound packages of sliced bacon and is sealed after carbon dioxide is directed into the envelope. This packaging method preserves the color, prevents moisture loss or absorption, and greatly retards the development of mold and rancidity. This bacon together with the new gelatin-coated meats, the vitamized and dehydrated foods are helping give our Army, even in remote outposts, a quality of food undreamed of a few years ago.

The two-day partial suspension of iron ore shipments thru the Soo Canal, due to the collapse of the railroad bridge over the St. Marys River approach to the Canal, cut a minimum of 715,000 tons from the cargo normally sent in October.

GEOGRAPHICAL PUBLICATIONS

Charles E. Kellogg. **The Soils That Support Us.** 370 pp., Ills., maps, appendices, index. The Macmillan Company, New York City, 1941. $3.50.

Hans Jenny. **Factors of Soil Formation, A System of Quantitative Pedology.** 281 pp. Maps, index. McGraw-Hill Book Company, Inc., York City, 1941. $3.50. (McGraw-Hill Publications in the Agricultural Sciences.)

In *The Soils That Support Us,* the chief of the Division of Soil Survey, United States Department of Agriculture, presents a non-technical account of soils, and their uses and mis-uses, with particular reference to this country.

Of the eighteen chapters, the opening five are primarily concerned with the nature of soils and their origin. With Chapter 6, "The Soils of Little Places and of Big Places," the discussion of the great soil groups and their sub-types begins. Appropriate emphasis is here placed on Podsols, Chernozem, Rendzina, Desert Soils, and soils of warm and tropical forested lands. The concluding chapters are devoted to problems of land use, improvement, conservation, and planning. This part of the work is most helpful to the geography teacher and student who may be presumed to have some familiarity with soil characteristics and types. The selection of material to illustrate man's modification of soil shows balance and restraint as well as wide knowledge. Soil erosion, for example, has not been allowed to monopolize the discussion.

The book is intended, on the one hand, to satisfy general reader-interest and, on the other, to provide students in bordering fields with a readable outline of fundamentals. To relieve the purely factual burden of the book proper, Appendix I contains a discussion of "Soil Classification and Soil Maps," and Appendix II consists of a descriptive outline of the great soil groups. Elsewhere there are a brief list of suggested readings and a glossary. The majority of the photographs are from the author's collection and apparently are here published for the first time.

The treatment is necessarily brief—perhaps too brief in places to satisfy either of the intended groups of readers. For example, the development in this country of soil science and of public interest in soils is considered in one paragraph of the opening chapter. The omissions are not serious, however, and the author shows talent in generalizing, where necessary, without introducing error. This is a much needed book and should be well received.

Dr. Jenny's volume, in contrast, is an advanced treatise in soil science. Here, soil properties are correlated with soil-forming factors in the belief that this approach will assist in "the understanding of soil differentiation," and "will help to explain the geographical distribution of soil types." The author points out that "the goal of the soil geographer is the assemblage of soil knowledge in the form of a map. In contrast, the goal of the 'functionalist' is the assemblage of soil knowledge in the form of a curve or an equation." Dr. Jenny has made an exhaustive study of the literature and frequently presents brilliant summaries of contrasting theoretical viewpoints. For example, in the chapter on climate and soil, the precipitation-evaporation ratios of De Martonne, Thornthwaite and Transeau are presented, but it is left to the reader to decide which is the more acceptable to the pedologist. The treatise is addressed to readers trained in higher mathematics, but others less versatile will find the work stimulating and, occasionally, directly useful. Especially interesting are the observational data on the rapidity of soil formation.

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Programs and Units in the Social Studies. Henry Kronenberg, editor. Curriculum Series: Number Two. 142 pp. The National Council of the Social Studies, 1201 Sixteenth Street, N.W., Washington, D.C. 1941. $1.50.

This volume is sponsored by the Curriculum Committee of the National Council for the Social Studies. Edgar B. Wesley, University of Minnesota, is the chairman of this Committee. The publication is an outgrowth of the wishes of the Council as voiced at its annual meeting held at St. Louis in 1940. At that time the Council approved of a publication devoted to brief outlines of a number of existing social studies programs. Each program was to feature a detailed account of one of its units. An experimental edition was released for criticism at the Atlantic City Meeting in 1941. The present volume embodies the revisions suggested at that time. One program and detailed unit therein is presented by each of the seventeen schools selected from widely distributed parts of the United States. Neither the Committee nor the Council approves or disapproves of the contributions offered. Each school selected one of these subjects for its particular unit within its curriculum: The Home, for grade 1; The Grocery Store, for grade 2; Norway, for grade 4; Modern Medicine, for grade 12; Making a Living, for grade 5; South America, for grade 6; Man Learns to Live in Safety and Comfort, for grade 7; Housing, for grade 8; Student Life, for grade 9; Crime, for grade 9; Law Observance, for grade 9; The Renaissance, for grade 9; Development of American Democracy, for grade 11; Propaganda Analysis, for grade 11; The Family, for grade 12; Marriage and the Family, for grade 12; Wealth and Income, for grade 12; and Community Planning, for grade 12. A dispassionate evaluation of each program and its individual unit is invited.

Chester R. Longwell, Adolph Knopf, Richard F. Flint. **Outlines of Physical Geology.** Second edition. 381 pp. Illustrated. 1941. $2.75; Charles Schuchert and Carl O. Dunbar. **Outlines of Historical Geology.** Fourth edition. 291 pp. Illustrated. 1941. $2.50; Adolph Knopf, Richard F. Flint, Charles Schuchert, and Carl O. Dunbar. **Outlines of Geology.** Second edition. 672 pp. Illustrated. 1941. $4.00.

Outlines of Physical Geology is Part I and Outlines of Historical Geology is Part II in the combined volume, *Outlines of Geology*. Outlines of Physical Geology presents a general description of the earth and the active processes at work upon and within it. An examination of the rocks and minerals of the earth's crust introduces the study. Then follows a description of the gradational processes and upbuilding forces at work on the crust, with sufficient examples to facilitate recognition of each in the field. Finally, the application of geologic principles is related to engineering projects and to the search for valuable mineral deposits and aids to their intelligent development and exploitation. *Outlines of Historical Geology,* is a general survey of the past history of the earth. The opening chapters deal with the constant changes revealed in all living things, and the understandings derived from the study of fossils. Thus is developed the Geologic Time Chart. Next come chapters dealing with the earth's changing features. The last part presents the pageant of life from the Paleozoic era, thru that known as the Age of Reptiles, thru that of the Mammals, and finally the coming of Man.